Report from the Airplane Performance Harmonization Working Group

1 – Statement of Task

Review FAA and JAA airplane operational performance requirements (FAR 121/FAR 135/JAR-OPS) and develop a list of differences between the two sets of requirements. (Use should be made of preliminary work on the task carried out by industry). During this review, if differences are identified in the associated certification requirements, such differences should be reported to the Aviation Rulemaking Advisory Committee (ARAC) and the HMT by the FAA and JAA contacts.

2 – Action taken

The HWG reviewed FAR/JAR differences reports generated by the JAA Performance Subcommittee, the Boeing Company and the FAA. These reports were all similar in their statements of the major differences. Additionally, the HWG conducted its own detailed review of the two sets of standards and developed a comparison document listing the JAR requirement, the corresponding FAR requirement, and any differences.

3 – Results

The comparison document developed by the HWG is provided below.

The HWG identified several items that may impact the certification requirements of FAR Part 25 and JAR Part 25:

- Takeoff path – the definition of the end of the takeoff path in §25.111 should be reviewed. That section defines the end of the takeoff path as the point in the takeoff at which the airplane is 1,500 feet above the takeoff surface, or at which the transition from the takeoff to the en-route configuration is completed and the final takeoff climb speed is reached, whichever is higher. The net takeoff flight path, which is used to show compliance with the operating limitations related to obstacle clearance, is derived from the takeoff path defined in §25.111. However, there are times when obstacle clearance considerations require an extension of the net takeoff flight path beyond the end of the takeoff path defined by 25.111. The Part 25 requirements do not address this situation, thus leaving it unclear as to what flight path must be used to show compliance with the obstacle clearance requirements.

- Alternative wet runway landing distance – the current FAR allows an operator to use a wet runway landing distance that is less than 115% of the corresponding dry runway distance if the alternative distance is based on actual landing techniques on wet runways and is provided in the Approved Airplane Flight Manual (AFM). This requires that the operator know the basis for data in the AFM. Since operators generally have no knowledge of the basis for data in the AFM, the HWG is proposing to move the demonstration requirements to Part 25.

- Go-around – the HWG identified an issue with the approach climb gradient information provided in the AFM in compliance with §25.121(d). That section allows the airplane

manufacturer to base the performance levels on airplane configurations and speeds that may not correspond to those recommended for a go-around in the Airplane Operating Manual.

- Wet/contaminated runways – JAR-OPS requires wet/contaminated runway performance data to be developed in accordance with JAR 25X1591, or an equivalent standard. Similar requirements should be placed in FAR Part 25.

JAR-OPS 1.010 Exemptions The Authority may exceptionally and temporarily grant an exemption from the provisions of JAR-OPS Part 1 when satisfied that there is a need and subject to compliance with any supplementary condition the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.	**FAR 121.173(f)** The Administrator may authorize in the operations specifications deviations from the requirements of this subpart if special circumstances make a literal observance of a requirement unnecessary for safety.	Exemptions from the JAR are granted only "exceptionally and temporarily." The FAR does not similarly limit deviations.
JAR-OPS 1.400 Approach and Landing Conditions (See IEM OPS 1.400) Before commencing an approach to land, the commander must satisfy himself that, according to the information available to him, the weather at the aerodrome and the condition of the runway intended to be used should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in the Operations Manual.	**FAR 121.601 Aircraft Dispatcher Information to Pilot in Command: Domestic and Flag Operations** (c) During a flight, the aircraft dispatcher shall provide the pilot in command any additional available information of meteorological conditions (including, adverse weather phenomena, such as clear air turbulence, thunderstorms, and low altitude wind shear), and irregularities of facilities and services, that may affect the safety of the flight. **FAR 121.603 Facilities and Services: Supplemental Operations** (b) During a flight, the pilot in command shall obtain any additional available information of meteorological conditions and irregularities of facilities and services that may affect the safety of the flight.	These requirements could be considered to be equivalent. The JAR specifically mentions the condition of the runway, while the FARs do not.

JAR-OPS 1.470 Applicability (a) An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg. and all multi-engine turbojet powered aeroplanes are operated in accordance with Subpart G (Performance Class A). (b) An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Subpart H (Performance Class B). (c) An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Subpart I (Performance Class C). (d) Where full compliance with the requirements of the appropriate Subpart cannot be shown due to specific design characteristics (e.g. supersonic aeroplanes or seaplanes), the operator shall apply approved performance standards that ensure a level of safety equivalent to that of the appropriate Subpart. (e) Multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 and with a maximum take-off mass of 5700 kg or less may be permitted by the Authority to operate under alternative operating limitations to those of Performance Class A which shall not be less restrictive than those of the relevant requirements of Subpart H. The provisions of subparagraph (e) above will expire on 1 April 2000.		

JAR-OPS 1.475 General (a) An operator shall ensure that the mass of the aeroplane: (1) At the start of the takeoff; or, in the event of in-flight replanning (2) At the point from which the revised operational flight plan applies, Is not greater than the mass at which the requirements of the appropriate Subpart can be complied with for the flight to be undertaken, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is provided for in the particular requirement. (b) An operator shall ensure that the approved performance data contained in the Aeroplane Flight Manual is used to determine compliance with the requirements of the appropriate Subpart, supplemented as necessary with other data acceptable to the Authority as prescribed in the relevant Subpart. When applying the factors prescribed in the appropriate Subpart, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual performance data to avoid double application of factors, (See AMC OPS 1.475(b) & IEM OPS 1.475(b)). (c) When showing compliance with the requirements of the appropriate Subpart, due account shall be taken of aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance. (d) For performance purposes, a damp runway, other than a grass runway, may be considered to be dry.		

JAR-OPS 1.480 Terminology (a) Terms used in Subparts F, G, H, I and J, and not defined in JAR-1, have the following meaning: (1) *Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of stopway, if such stopway is declared available by the appropriate Authority and is capable of bearing the mass of the aeroplane under the prevailing operating conditions. (2) *Contaminated runway.* A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following: (i) Surface water more than 3 mm (0.125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125 in) of water; (ii) Snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or (iii) Ice, including wet ice. (3) *Damp runway.* A runway is considered damp when the surface is not dry, but when the moisture on it does not give it a shiny appearance. (4) *Dry runway.* A dry runway is one which is neither wet nor contaminated, and includes those paved runways which have been specially prepared with grooves or porous pavement and maintained to retain effectively dry braking action even when moisture is present. (5) *Landing distance available (LDA).* The length of the runway which is declared available by the appropriate Authority and suitable for the ground run of an aeroplane landing.	**FAR 121.171** (b) For the purposes of this part, "effective length of the runway" for landing means the distance from the point at which the obstruction clearance plane associated with the approach end of the runway intersects the centerline of the runway to the far end thereof.	

(6) *Maximum approved passenger seating configuration.* The maximum passenger seating capacity of an individual aeroplane, excluding pilot seats or flight deck seats and cabin crew seats as applicable, used by the operator, approved by the Authority and specified in the Operations Manual. (7) *Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway available. (8) *Take-off mass.* The take-off mass of the aeroplane shall be taken to be its mass, including everything and everyone carried at the commencement of the take-off run. (9) *Take-off run available (TORA).* The length of runway which is declared available by the appropriate Authority and suitable for the ground run of an aeroplane taking off. (10) *Wet runway.* A runway is considered wet when the runway surface is covered with water, or equivalent, less than specified in subparagraph (a)(2) above or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.		
(b) The terms 'accelerate-stop distance', 'take-off distance', 'take-off run', 'net take-off flight path', 'one engine inoperative en-route net flight path' and 'two engines inoperative en-route net flight path' as relating to the aeroplane have their meanings defined in the airworthiness requirements under which the aeroplane was certified, or as specified by the Authority if it finds that definition inadequate for showing compliance with the performance operating limitations.	**FAR 121.189** (g) For the purposes of this section the terms, "takeoff distance," "takeoff run," "net takeoff flight path," and "takeoff path" have the same meanings as set forth in the rules under which the airplane was certificated.	

JAR-OPS 1.485 General	**FAR 121.173 General**	
(a) An operator shall ensure that, for determining compliance with the requirements of this subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance Data in the Aeroplane Flight Manual is insufficient in respect of items such as: (1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and (2) Consideration of engine failure in all flight phases.	(d) The performance data in the Airplane Flight Manual applies in determining compliance with sections 121.175 through 121.197. Where conditions are different from those on which the performance data is based, compliance is determined by interpolation or by computing the effects of changes in the specific variables, if the results of the interpolation or computations are substantially as accurate as the results of direct tests.	JAR allows use of "accepted" data, while FAR allows use of AFM data only.
(b) An operator shall ensure that for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (See IEM OPS 1.485(b)).	No corresponding requirement.	

JAR-OPS 1.490 Take-off	**FAR 121.189 Airplanes: Turbine Engine Powered: Takeoff Limitations**	
(a) An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.	(a) No person operating a turbine-engine-powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual for the elevation of the airport and the ambient temperature existing at takeoff.	The JAR requires use of airport pressure altitude, while the FAR requires use of airport elevation.
(b) An operator must meet the following requirements when determining the maximum permitted take-off mass:	(c) No person operating a turbine-engine-powered airplane certificated after August 29, 1959 (SR422B), may take off that airplane at a weight greater than that listed in the Airplane Flight Manual at which compliance with the following may be shown:	
(1) The accelerate-stop distance must not exceed the accelerate-stop distance available;	(1) The accelerate-stop distance must not exceed the length of the runway plus the length of any stopway.	Identical requirement.
(2) The take-off distance must not exceed the take-off distance available, with a clearway distance not exceeding half of the take-off run available;	(2) The takeoff distance must not exceed the length of the runway plus the length of any clearway except that the length of any clearway included must not be greater than one-half the length of the runway.	Identical requirement.
(3) The take-off run must not exceed the take-off run available;	(3) The takeoff run must not be greater than the length of the runway.	Identical requirement.
(4) Compliance with this paragraph must be shown using a single value of V1, for the rejected and continued take-off; and	No corresponding requirement.	This is related to the JAR requirement to account for wet and contaminated runways.
(5) On a wet or contaminated runway, the take-off mass must not exceed that permitted for a take-off on a dry runway under the same conditions.	No corresponding requirement.	This is related to the JAR requirement to account for wet and contaminated runways.
(c) When showing compliance with subparagraph (b) above, an operator must take account of the following: (1) The pressure altitude at the aerodrome. (2) The ambient temperature at the aerodrome and (3) The runway surface condition and the type of runway surface (See IEM OPS 1.490(c)(3)). (4) The runway slope in the direction of take-off;	(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff, and, if operating limitations exist for the minimum distances required for takeoff from wet runways, the runway surface condition (dry or wet). Wet runway distances associated with grooved or porous friction course runways, if provided in the Airplane Flight Manual, may be used only for runways that are grooved or treated with a porous friction course (PFC) overlay, and that the operator determines are designed, constructed, and maintained in a manner acceptable to the Administrator.	The JAR requires use of airport pressure altitude, while the FAR requires use of airport elevation. The FAR requires wet runway accountability only for airplanes where wet runway performance information is provided in the Airplane Flight Manual and provides a means for operators to take credit for runway surface treatment. Contaminated runway accountability is not required by the FAR.

(5) Not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component; and	No corresponding requirement.	This is addressed in 25.105(d)(1) for large airplanes.
(6) The loss, if any, of runway length due to alignment of the aeroplane prior to take-off. [(See IEM OPS 1.490(c)(6),)]	No corresponding requirement.	The FAR does not require alignment distance accountability.

JAR-OPS 1.495 Take-off Obstacle Clearance	**FAR 121.189 (continued)**	
(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 ft or by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has traveled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus 0.125 x D may be used. (See IEM OPS 1.495(a).)	(d) No person operating a turbine-engine-powered transport category airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual - (2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.	The FAR can be interpreted to require a significantly smaller obstacle accountability area. The draft Advisory Circular 120.XXX provides guidance material for area analysis and flight track analysis methods.
(b) When showing compliance with subparagraph (a) above, an operator must take account of the following: (1) The mass of the aeroplane at the commencement of the take-off run; (2) The pressure altitude at the aerodrome; (3) The ambient temperature at the aerodrome; and	(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff,.....	The JAR requires use of airport pressure altitude, while the FAR requires use of airport elevation.
(4) Not more than 50% of the reported head-wind component or not less than 150% of the reported tailwind component.	No corresponding requirement.	This is addressed in 25.105(d)(1) for large airplanes.
(c) When showing compliance with subparagraph (a) above: (1) Track changes shall not be allowed up to the point at which the net take-off flight path has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run available. Thereafter, up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15°. Above 400 ft height bank angles greater than 15°, but not more than 25° may be scheduled.	(f) For the purposes of this section, it is assumed that the airplane is not banked before reaching a height of 50 feet, as shown by the takeoff path or net takeoff flight path data (as appropriate) in the Airplane Flight Manual, and thereafter that the maximum bank is not more than 15 degrees.	The FAR assumes bank angles of no more than 15 degrees. The JAR limits the start-of-turn altitude to one-half the wingspan or 50 feet, whichever is greater.
(2) Any part of the net take-off flight path in which the aeroplane is banked by more than 15° must clear all obstacles within the horizontal distances specified in subparagraphs (a), (d) and (e) of this paragraph by a vertical distance of at least 50 ft, and	No corresponding requirement.	The draft AC provides guidance material to enable an operator to use bank angles of more than 15 degrees, but does not require additional vertical obstacle clearance where bank angles exceed 15 degrees.

(3) An operator must use special procedures, subject to the approval of the Authority, to apply increased bank angles of not more than 20° between 200 ft and 400 ft, or not more than 30° above 400 ft (See Appendix 1 to JAR-OPS 1.495(c)(3)).	No corresponding requirement.	
(4) Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (See AMC OPS 1.495(c)(4)).	No corresponding requirement.	The draft AC contains guidance material which is identical to that provided in the referenced AMC with respect to stall margin and gradient loss. Additionally, the draft AC provides suggested methods to account for the acceleration to the increased speeds on required takeoff distances and/or flight paths.
(d) When showing compliance with subparagraph (a) above for those cases where the intended flight path does not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:	No corresponding requirement.	
(1) 300 m, if the pilot is able to maintain the required navigational accuracy through the [obstacle accountability area (See AMC OPS 1.495(d)(1) & (e)(l); or]		The draft AC provides operators with methods to account for ground-based course guidance, airplane-based navigational capabilities, and visual course guidance.
(2) 600 m for flights under all other conditions.		
(e) When showing compliance with subparagraph (a) above for those cases where the intended flight path does required track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:	No corresponding requirement.	
(1) 600 m, if the pilot is able to maintain the required navigational accuracy through the [obstacle accountability area (see AMC OPS 1.495(d)(1) & (e)(1)); or		
(2) 900 m for flights under all other conditions.		
(f) An operator shall establish contingency procedures to satisfy the requirements of JAR-OPS 1.495 and to provide a safe route, avoiding obstacles, to enable the aeroplane to either comply with the en-route requirements of JAR-OPS 1.500, or land at either the aerodrome of departure or at a take-off alternate aerodrome (See IEM OPS 1.495(f)).	No corresponding requirement.	The FAR does not specifically require analysis in this area, although the draft AC does.

JAR-OPS 1.500 En-route – One Engine Inoperative (See AMC OPS 1.500)	**FAR 121.191 Airplanes: Turbine-Engine-Powered: Enroute Limitations: One Engine Inoperative**	
(a) An operator shall ensure that the one engine inoperative en-route net flight path data shown in the Aeroplane Flight Manual, appropriate to the meteorological conditions expected for the flight, complies with either subparagraph (b) or (c) at all points along the route. The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after engine failure. In meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account.	(a) No person operating a turbine-engine-powered airplane may take off that airplane at a weight, allowing for normal consumption of fuel and oil, that is greater than that which (under the approved, one engine inoperative enroute net flight path data in the Airplane Flight Manual for that airplane) will allow compliance with paragraphs (a)(1) or (2) of this section, based on the ambient temperatures expected enroute.	The JAR specifically requires the effect of anti-icing to be taken into account when dictated by meteorological conditions.
(b) The gradient of the net flight path must be positive at least 1000 ft above all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track.	(1) There is a positive slope at an altitude of at least 1,000 feet above all terrain and obstructions within five statute miles on each side of the intended track, and, in addition, if that airplane was certificated after August 29, 1959 (SR422B) there is a positive slope at 1,500 feet above the airport where the airplane is assumed to land after an engine fails.	The JAR uses nautical miles, while the FAR uses statute miles.
(c) The net flight path must permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with JAR-OPS 1.515 or 1.520 as appropriate, the net flight path clearing vertically, by at least 2000 ft, all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track in accordance with subparagraphs (1) to (4) below:	(2) The net flight path allows the airplane to continue flight from the cruising altitude to an airport where a landing can be made under section 121.197, clearing all terrain and obstructions within five statute miles of the intended track by at least 2,000 feet vertically and with a positive slope at 1,000 feet above the airport where the airplane lands after an engine fails, or, if that airplane was certificated after September 30, 1958 (SR422A, 422B), with a positive slope at 1,500 feet above the airport where the airplane lands after an engine fails.	The JAR uses nautical miles, while the FAR uses statute miles.
	(b) For the purposes of paragraph (a) (2) of this section it is assumed that -	
(1) The engine is assumed to fail at the most critical point along the route;	(1) The engine fails at the most critical point enroute;	
No corresponding requirement.	(2) The airplane passes over the critical obstruction, after engine failure at a point that is no closer to the obstruction than the nearest approved radio navigation fix, unless the Administrator authorizes a different procedure based on adequate operational safeguards;	The JAA PERFSC proposed that this FAR requirement could be included as an IEM.

(2) Account is taken of the effects of winds on the flight path;	(3) An approved method is used to allow for adverse winds;	The FAR addresses only adverse winds, while the JAR allows wind benefit
(3) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used, and	(4) Fuel jettisoning will be allowed if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;	The FAR addresses procedures and flight crew training, while the JAR addresses only procedures. The JAR specifically references fuel remaining after dumping.
(4) The aerodrome where the aeroplane is assumed to land after engine failure must meet the following criteria: (i) The performance requirements at the expected landing mass are met; and (ii) Weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing.	(5) The alternate airport is specified in the dispatch or flight release and meets the prescribed weather minimums; and	The FAR requires that the alternate airport meet weather minimums. The JAR addresses field condition reports.
No corresponding requirement.	(6) The consumption of fuel and oil after engine failure is the same as the consumption that is allowed for in the approved net flight path data in the Airplane Flight Manual.	
(d) When showing compliance with JAR-OPS 1.500, an operator must increase the width margins of subparagraphs (b) and (c) above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.	No corresponding requirement.	The JAR addresses navigational accuracy, while the FAR does not.

JAR-OPS 1.505 En-route – Aeroplanes with Three or More Engines, Two Engines Inoperative	**FAR 121.193 Airplanes: Turbine engine powered: Enroute Limitations: Two Engines Inoperative**	
	(c) *Aircraft certificated after August 29, 1959* (SR422B). No person may operate a turbine-engine-powered airplane along an intended route unless he complies with either of the following:	
(a) An operator shall ensure that at no point along the intended track will an aeroplane having three or more engines be more than 90 minutes, at the all-engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with subparagraphs (b) to (f) below.	(1) There is no point along the intended track that is more than 90 minutes (with all engines operating at cruising power) from an airport that meets the requirements of section 121.197.	The speeds used to determine the 90 minute threshold are different.
(b) The two engines inoperative en-route net flight path data must permit the aeroplane to continue the flight, in the expected meteorological conditions, from the point where two engines are assumed to fail simultaneously, to an aerodrome at which it is possible to land and come to a complete stop when using the prescribed procedure for a landing with two engines inoperative. The net flight path must clear vertically, by at least 2000 ft all terrain and obstructions along the route within 9. 3 km (5 nm) on either side of the intended track. At altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data must be taken into account. If the navigational accuracy does not meet the 95% containment level, an operator must increase the width margin given above to 18.5 km (10 nm).	(2) Its weight, according to the two-engine inoperative, enroute, net flight path data in the Airplane Flight Manual, allows the airplane to fly from the point where the two engines are assumed to fail simultaneously to an airport that meets the requirements of section 121.197, with the net flight path (considering the ambient temperatures anticipated along the track) clearing vertically by at least 2,000 feet all terrain and obstructions within five statute miles (4.34 nautical miles) on each side of the intended track. For the purposes of this subparagraph, it is assumed that -	The JAR uses nautical miles, while the FAR uses statute miles. The JAR requirement for landing distance is the two-engine-inoperative unfactored distance, whereas the FAR requirement is the normal factored distance. The JAR specifically requires the effect of anti-icing to be taken into account when dictated by meteorological conditions. The JAR addresses navigational accuracy, while the FAR does not.
(c) The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, at the all engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.	(i) The two engines fail at the most critical point enroute;	
(d) The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.	(ii) The net flight path has a positive slope at 1,500 feet above the airport where the landing is assumed to be made after the engines fail;	

(e) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.	(iii) Fuel jettisoning will be approved if the certificate holder shows that the crew is properly instructed, that the training program is adequate, and that all other precautions are taken to ensure a safe procedure;	The FAR addresses procedures and flight crew training, while the JAR addresses only procedures. The JAR specifically references fuel remaining after dumping.
(f) The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at least 1500 ft directly over the landing area and thereafter to fly level for 15 minutes.	(iv) The airplane's weight at the point where the two engines are assumed to fail provides enough fuel to continue to the airport, to arrive at an altitude of at least 1,500 feet directly over the airport, and thereafter to fly for 15 minutes at cruise power or thrust, or both, and	The conditions used to determine the 15 minute fuel requirement are different.
No corresponding requirement.	(v) The consumption of fuel and oil after the engine failure is the same as the consumption that is allowed for in the net flight path data in the Airplane Flight Manual.	

JAR-OPS 1.510 Landing – Destination and Alternate Aerodromes (See AMC OPS 1.510 and 1.515)	**FAR 121.195 Airplanes: Turbine Engine Powered: Landing Limitations: Destination Airports**	
(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.	(a) No person operating a turbine-engine-powered airplane may take off that airplane at such a weight that (allowing for normal consumption of fuel and oil in flight to the destination or alternate airport) the weight of the airplane on arrival would exceed the landing weight set forth in the Airplane Flight Manual for the elevation of the destination or alternate airport and the ambient temperature anticipated at the time of landing.	The JAR refers to airport altitude, while the FAR refers to airport elevation.
(b) For instrument approaches with decision heights below 200 ft, an operator must verify that the approach mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for go-around of at least 2.5%, or the published gradient, whichever is the greater. The use of an alternative method must be approved by the Authority. (See IEM OPS 1.510(b)).	No corresponding requirement.	The FAR does not require increased approach climb gradient capability for low visibility approaches.

JAR-OPS 1.515 Landing – Dry Runways (See AMC OPS 1.510 and 1.515)	**FAR 121.195 (continued)**	
(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR-OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:	(b) Except as provided in paragraphs (c), (d), or (e) of this section, no person operating a turbine-engine-powered airplane may take off that airplane unless its weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance set forth in the Airplane Flight Manual for the elevation of the destination airport and wind conditions anticipated there at the time of landing), would allow a full stop landing at the intended destination airport within 60 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway.	The JAR refers to 50 feet above the threshold, while the FAR refers to 50 feet above the intersection of the obstruction clearance plane and the runway.
(1) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or		The FAR requires all airplanes to land within 60% of the effective runway, while the JAR permits turbopropeller airplanes to land within 70%.
(2) For turbo-propeller powered aeroplanes, within 70% of the landing distance available.	**FAR 121.197 Airplanes: Turbine Engine Powered: Landing Limitations: Alternate Airports** No person may list an airport as an alternate airport in a dispatch or flight release for a turbine-engine-powered airplane unless (based on the assumptions in section 121.195(b)) that airplane at the weight anticipated at the time of arrival can be brought to a full stop within 70 percent of the effective length of the runway for turbopropeller powered airplanes and 60 percent of the effective length of the runway for turbojet powered airplanes, from a point 50 feet above the intersection of the obstruction clearance plane and the runway. In the case of an alternate airport for departure, as provided in section 121.617, allowance may be made for fuel jettisoning in addition to normal consumption of fuel and oil when determining the weight anticipated at the time of arrival.	The JAR refers to 50 feet above the threshold, while the FAR refers to 50 feet above the intersection of the obstruction clearance plane and the runway. The FAR requires all airplanes to land within 60% of the effective runway, while the JAR permits turbopropeller airplanes to land within 70%.
(3) For Steep Approach procedures the Authority may approve the use of landing distance data factored in accordance with subparagraphs (a) (1) and (a)(2) above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (See Appendix 1 to JAR-OPS 1.515(a)(3)).	No corresponding requirement.	
(4) When showing compliance with subparagraphs (a) (1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see Appendix 1), the use of Short Landing Operations in accordance with Appendices 1 and 2 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in	No corresponding requirement.	

the particular case.		
(b) When showing compliance with subparagraph (a) above, an operator must take account of the following:		
(1) The altitude at the aerodrome.		The JAR refers to airport altitude, while the FAR refers to airport elevation.
(2) Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and	No corresponding requirement.	This is addressed in 25.125(e) for large airplanes.
(3) The runway slope in the direction of landing if greater than +/-2%.		Corrections for increased runway slopes are not addressed by the FAR.
	FAR 121.195(b) (continued)	
(c) When showing compliance with subparagraph (a) above, it must be assumed that:	For the purpose of determining the allowable landing weight at the destination airport the following is assumed:	
(1) The aeroplane will land on the most favorable runway, in still air; and	(1) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.	The JAR does not address landing direction. This may have implications depending on landing aids, terrain and slope.
(2) The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (See IEM OPS 1.515(c)).	(2) The airplane is landed on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane, and considering other conditions such as landing aids and terrain.	The JAR specifies the runway most likely to be assigned, while the FAR specifies the most suitable runway.
(d) If an operator is unable to comply with subparagraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with subparagraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and subparagraphs (a) and (b) above.	No corresponding requirement.	The JAR allows an airplane to be dispatched to single runway destinations without complying with any of the field length requirements.
(e) If an operator is unable to comply with subparagraphs (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with subparagraphs (a), (b) and (c).	(c) A turbopropeller powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section, may be taken off if an alternate airport is specified that meets all of the requirements of this section except that the airplane can accomplish a full stop landing within 70 percent of the effective length of the runway.	

	(e) A turbojet powered airplane that would be prohibited from being taken off because it could not meet the requirements of paragraph (b)(2) of this section may be taken off if an alternate airport is specified that meets all the requirements of paragraph (b) of this section.	

JAR-OPS 1.520 Landing – Wet and Contaminated Runways	**FAR 121.195 (continued)**	
(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR-OPS 1.515.	(d) Unless, based on a showing of actual operating landing techniques on wet runways, a shorter landing distance (but never less than that required by paragraph (b) of this section) has been approved for a specific type and model airplane and included in the Airplane Flight Manual, no person may take off a turbojet powered airplane when the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the destination airport may be wet or slippery at the estimated time of arrival unless the effective runway length at the destination airport is at least 115 percent of the runway length required under paragraph (b) of this section.	The FAR requires wet runway accountability for turbojet-powered airplanes only. The FAR requires wet runway accountability at the destination airport only.
(b) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available must be at least the landing distance determined in accordance with subparagraph (a) above, or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.	No corresponding requirement.	The FAR requires accountability for slippery runways using the same factor as for wet runways. Specific runway contaminants are not addressed.
(c) A landing distance on a wet runway shorter than that required by subparagraph (a) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.	See (d) above.	The FAR requires an actual demonstration of wet runway landing techniques in order to use a lesser distance.
(d) A landing distance on a specially prepared contaminated runway shorter than that required by subparagraph (b) above, but not less than that required by JAR-OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on contaminated runways.	No corresponding requirement.	
When showing compliance with subparagraphs (b), (c) and (d) above, the criteria of JAR-OPS 1.515 shall be applied accordingly except that JAR-OPS 1.515(a)(1) and (2) shall not be applied to subparagraph (b) above.	No corresponding requirement.	